

# The Transcaucasian Species of *Coccobius* Ratzeburg 1852 (Chalcidoidea: Aphelinidae), with the Description of Three New Species from Georgia

GEORGE JAPOSHVILI AND ISMAIL KARACA

(GJ) Entomology and Biocontrol Research Centre, Ilia State University, Tbilisi, Georgia;  
giorgij70@yahoo.com

(IK) Department of Plant Protection, Faculty of Agriculture, Suleyman Demirel University, Isparta, Turkey; ikaraca@sdu.edu.tr

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**Abstract.**—The species of *Coccobius* Ratzeburg from Transcaucasia are listed and *Coccobius kato*, *C. nunu* and *C. omari* are described as new. Information on distribution, synonyms and hosts for eleven species is given. A key to the females of the *Coccobius* species from the Transcaucasus region is provided.

**Key words.**—*Coccobius*, Transcaucasia, Georgia, new species, Parasitoids, Biocontrol

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The genus *Coccobius* Ratzeburg contains 81 species worldwide (Noyes 2009). They are parasitoids of Diaspididae (Hemiptera: Coccoidea) and some of them have been used in the biocontrol of harmful pests. For example, *Coccobius testaceus* (Masi) has been used as a control agent against *Lepidosaphes ulmi* (Linnaeus) and other armoured scale insects in the former USSR and Western Europe (Yasnosh 1968). This species was introduced into the USA for the control of *Lepidosaphes beckii* (Newman) (Flanders 1942; Myartseva 1995). *Coccobius varicornis* (Howard) was used against *Diaspidiotus perniciosus* (Comstock), *Aspidiotus destructor* Cockerell and other armoured scales in California. *Coccobius odonaspidis* (Tachikawa) is a host-specific parasitoid of *Odonaspis secreta* (Cockerell) in Japan (Yasnosh 1968).

The genus *Coccobius* is rather distinctive and is not likely to be confused with any other aphelinid genus. All known species show a high degree of structural similarity (Hayat 1985). Prior to our studies on *Coccobius* from the Transcaucasus, the following species were known from the region: *C. contigaspidis* (Yasnosh), *C. ephedrasi* (Yasnosh), *C. granati* Yasnosh & Mustafaeva, *C. indefinitus* (Yasnosh & Myartseva), *C. mesasiaticus* (Yasnosh & Myartseva), *C. noaee* (Yasnosh), *C. pistaci-*

*colus* (Yasnosh), *C. subterraneus* (Nikol'skaya) and *C. testaceus* (Masi). The genus is almost cosmopolitan in distribution and recent additions of species from the Palearctic, Nearctic, Neotropical, Afrotropical and Oriental regions indicate that there should be more undescribed species.

The generic names *Physcus* Howard, *Encyrtophyscus* Blanchard and *Physculus* Yasnosh were placed in synonymy with *Coccobius* by Hayat (1983), but all the species known in these genera were not then specifically transferred to *Coccobius* until Hayat's new publication (Hayat 1985), where he transferred all the species to the present genus as new combinations.

## MATERIAL AND METHODS

This work is based upon specimens deposited in the following collections, with abbreviations used in text: St. Petersburg Museum of Zoology (ZIN); personal collection of V. Yasnosh housed in the L. Kanchaveli Plant Protection Institute of the Georgian Academy of Agriculture (VYC); personal collection of the first author, housed in the Institute of Zoology of Ilia Chavchavadze state University, former Institute of Zoology, Georgian Academy of Sciences, Tbilisi, Georgia (IZGAS) and the Natural History Museum, London,

U.K. (BMNH). Descriptions and terminology follow Hayat (1998).

## RESULTS

### *Coccobius* Ratzeburg

*Coccobius* Ratzeburg, 1852: 195. Type: *Coccobius annulicornis* Ratzeburg, designated by Gahan and Fagan 1923: 37.

*Physcus* Howard, 1895: 43. Type: *Coccophagus varicornis* Howard, by monotypy.

*Encyrtophyscus* Blanchard, in De Santis, 1948: 192. Type: *Physcus flavoflagellatus* De Santis, by original designation.

*Physculus* Yasnosh, 1977: 1115. Type: *Physculus danzigae* Yasnosh, by original designation.

*Diagnosis.*—Female: antenna with one anellus between pedicel and F1 and with 7 segments; mandible with two teeth and

truncation; maxillary palpi two-segmented, labial palpi unsegmented; pronotum narrow in dorsal view; median lobe of mesoscutum large, with numerous setae; axilla small with one seta; scutellum large, posterior margin widely rounded; fore wing without linea calva; disc usually setose to base; submarginal vein with 4 or more setae; tarsal formula 5-5-5; mid tibial spur large (compared to other aphelinid genera, except *Marietta* Motschulsky); gaster at least as long as thorax; hypopygium not reaching apex of gaster.

Male: similar to female, except antenna with 8 segments (1.1.6) and genitalia, which is elongate, phallobase almost truncate, narrowed in basal third and with apex bifid (Hayat 1985).

## KEY TO THE FEMALES OF TRANSCAUCASIAN SPECIES OF COCCOBIUS

1. Brachypterous ..... *subterraneus* (Nikol'skaya)
- Macropterous ..... 2
2. Antenna uniformly coloured ..... 3
- Antenna differently coloured ..... 4
3. Clypeus margin with brown band, mesoscutum with medial vertical line .....  
..... *omari* Japoshvili sp. n.
- Clypeus margin without brown band, mesoscutum entirely fulvous .....  
..... *ephedraspidis* (Yasnosh)
4. Antennae with F1 and clava very slightly dusky ..... *nunu* Japoshvili sp. n.
- Antennae with F1 and clava dark brown ..... 5
5. Thorax and usually the head, mostly yellow to brownish-yellow, with minimum of  
dark markings ..... 6
- Thorax and usually the head, mostly dark brown to black ..... 9
6. F1 slightly shorter than than pedicel, clava longer than funicle ..... 7
- F1 usually somewhat longer than pedicel or subequal, clava usually shorter than  
funicle ..... *testaceus* (Masi)
7. F1 subquadrate or very slightly longer than wide .... *granati* Yasnosh et Mustafaeva
- F1 almost 1.5× as long as wide ..... 8
8. F3 1.25× as long as wide. Clava length equal to all funicle length together .....  
..... *indefinites* (Yasnosh & Myartseva)
- F3 1.56× as long as wide. Clava slightly longer than funicle ... *kato* Japoshvili sp. n.
9. Submarginal vein at most with 6 and marginal vein with 9 setae ..... 10
- Submarginal vein with at least 7 and marginal vein with 10 setae *contigaspidis* (Yasnosh)
10. Marginal fringe at the apex of fore wing almost 0.25× as long as width of forewings,  
mesoscutum and scutellum with small cellular sculpture ... *pistacicolus* (Yasnosh)
- Marginal fringe at the apex of forewings shorter than 0.25× as long as width of  
forewings, mesoscutum and scutellum with bigger cellular sculpture .....  
..... *noaeae* (Yasnosh)

***Coccobius contigaspidis* (Yasnosh 1968)**

*Distribution*.—Armenia (Yasnosh 1968).

*Host*.—*Contigaspis kochiae* Borchsenius (Diaspididae) (Yasnosh 1968; Ben-Dov et al. 2008).

***Coccobius ephedraspidis* (Yasnosh 1968)**

*Distribution*.—Georgia, Turkmenistan (Yasnosh 1968).

*Host*.—*Dynaspidiotus ephedrarum* (Lindinger) (Diaspididae) (Yasnosh 1968; Ben-Dov et al. 2008).

***Coccobius granati* Yasnosh & Mustafaeva 1992**

*Distribution*.—Azerbaijan (Yasnosh and Mustafaeva 1992).

*Host*.—*Lepidosaphes granati* Koroneos (Diaspididae) (Yasnosh and Mustafaeva 1992).

***Coccobius indefinitus* (Yasnosh & Myartseva 1972).**

*Distribution*.—Armenia, Tajikistan, Turkmenistan (Yasnosh and Myartseva 1972).

*Host*.—*Chlidaspis asiatica* (Archangelskaya) (Diaspididae) (Yasnosh and Myartseva 1972).

***Coccobius noaeae* (Yasnosh 1968)**

*Distribution*.—Azerbaijan, Georgia (Yasnosh 1978).

*Host*.—*Duplacionaspis noaeae* (Hall) (Diaspididae) (Yasnosh 1978; Ben-Dov et al. 2008).

***Coccobius pistacicolus* (Yasnosh 1968)**

*Distribution*.—Azerbaijan, Georgia (Yasnosh 1978).

*Host*.—*Lepidosaphes pistaciae* Archangelskaya (Diaspididae) (Yasnosh 1978).

*Comments*.—Dr V. Yasnosh recorded 3 females (Yasnosh 1968), which we have not been able to find, unfortunately, in St. Petersburg (ZIN) or in her personal collection. There has also been no record of this species since then. We suppose that this species could be a synonym of *C. testaceus*. However, further study is needed to verify whether this species is a junior synonym of *C. testaceus*.

***Coccobius subterraneus* (Nikol'skaya 1966)**

*Distribution*.—Armenia (Nikol'skaya and Yasnosh 1966).

*Host*.—*Chortinaspis subterranea* (Lindinger) (Diaspididae) (Nikol'skaya and Yasnosh 1966; Ben-Dov et al. 2008).

***Coccobius testaceus* (Masi, 1909)**

*Distribution*.—Azerbaijan, Croatia, Czech Republic, Egypt, France, Georgia, Germany, Hungary, Iran, Italy, Lebanon, Moldova, Montenegro, China, Poland, Romania, Spain, Turkey, Ukraine, UK, USA, Uzbekistan (Noyes 2009).

*Hosts*.—*Chionaspis salicis* (L.), *Chlidaspis asiatica* (Archangelskaya), *Contigaspis kochiae* Borchsenius, *Diaspidiotus prunorum* (Laing), *D. transcaspensis* (Marlatt), *D. gigas* (Thiem & Gerneck), *D. jaapi* (Leonardi), *D. perniciosus* (Comstock), *D. slavonicus* (Green), *Furchadaspis zamiae* (Morgan) (Noyes 2009; Ben-Dov et al. 2008), *Lepidosaphes beckii* (Newman) (Myartseva 1995), *L. conchiformis* (Gmelin), *L. malicola* Borchsenius, *L. ulmi* (L.), *Lineaspis striata* (Newstead), *Parlatoria oleae* (Colvée), *Eriococcus spuriosus* (Modeer) (Noyes 2009; Ben-Dov et al. 2008).

***Coccobius kato* Japoshvili sp. n.**

*Material Examined*.—*Holotype*, ♀, GEORGIA: Vashlovani, ex *Lineaspis striata* (Newstead) on *Thuja* sp. 2.VI. – 15.VII.2003, G. Japoshvili (IZGAS). *Paratypes*, 3 ♀♀, same data as holotype (IZGAS). *Homoeotype*: ♀ with label: *Physcus* sp. aff. *pistacicolus* Yasnosh ex *Lineaspis striata* collected on *Juniperus foetidissima*, 20.V.1968.

*Female*.—Length, 0.44–0.70 mm (Holotype: 0.56 mm).

Entire body yellow, legs and antenna slightly paler. F1 slightly brownish and clava brown. Head 1.8× as wide as FV. Head in front view almost as wide as high. Ocelli with apical angle obtuse. Eyes long, 2× as long as malar space. Toruli with upper margins level with lower eye margins. Antenna as Fig. 1A. Pedicel 1.8×, F1 – 1.56×, F2 – 1.4×, F3 – 1.45×, C1 – 1.2×, C2

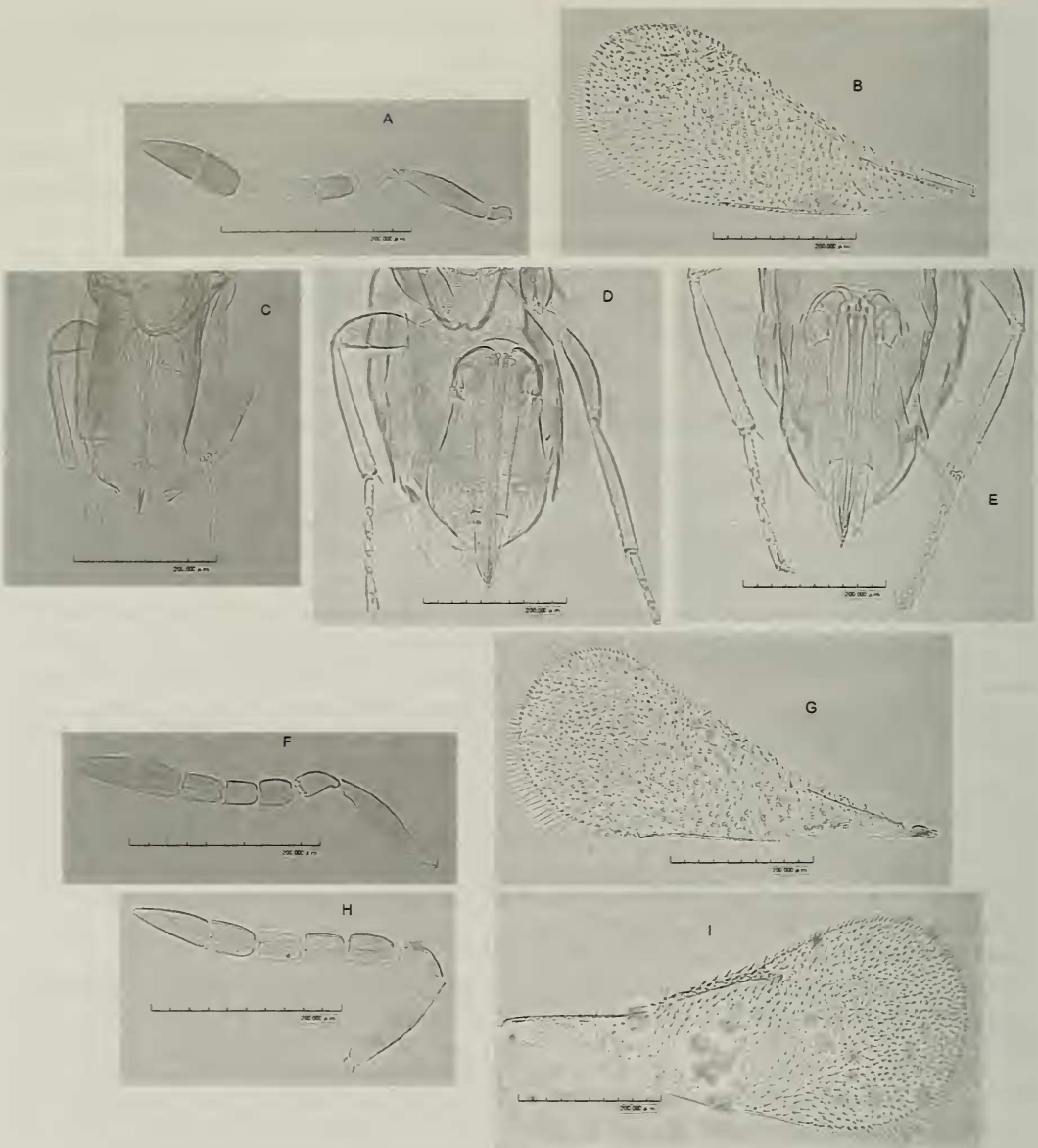


Fig. 1. *Coccobius kato* Japoshvili, sp.n. antenna (A), left fore wing (B), ovipositor (C); *C. omari* Japoshvili, sp.n. ovipositor (D), antenna (F), left fore wing (G); *C. numu* Japoshvili sp.n. ovipositor (E), antenna (H), right fore wing (I).

– 2× as long as wide. Scape slightly more than 4× as long as wide. Mesoscutum (26) longer than scutellum (22). Scutellum 1.3× as wide as long.

Fore wings 2.6× as long as wide (Fig. 1B). Marginal fringe about 0.25× as long as wing width. Submarginal: marginal: stigmal veins as following 37:27:7. Hind wing slightly more than 5.5× as long

as wide. Marginal fringe almost equal to that of wing width. Gaster slightly shorter (11:14) than head plus thorax. Pygostyles inserted at the 0.6 distance from base. Ovipositor (Figure 1C) second valvifer 0.7× as long as ovipositor and third valvula 0.4× as long as second valvifer. Ovipositor 1.5× longer than midtibia.

*Male*.—Unknown.

*Comments.*—The new species is close to *C. indefinitus* Yasnosh & Myartseva, but differs by the characters given in Table 1. The species mentioned as *Physcus* sp. aff. *pistacicolus* by Yasnosh (1972), is probably conspecific with this new species.

***Coccobius omari* Japoshvili, sp.n.**

*Material Examined.*—*Holotype*, ♀, GEORGIA: Tbilisi, Gldanula, ex *Prodiaspis tamaricicola* (Malenotti) on *Tamarix* sp. 28.VI. – 20.VII.1998, G. Japoshvili (IZGAS). *Paratypes*, 10♀♀, same data as holotype (IZGAS).

*Female.*—Length, 0.62–0.89 mm. (Holotype: 0.67 mm).

Head with metallic lustre infuscated yellow or testaceous-brownish yellow. Anterior part of pronotum, mesoscutum in the middle vertically, and tergites, with hardly noticeable brownish lines. All body yellow. Femora and tibia brownish. Face above clypeus with dark brown band joining to eyes on margin. Antennae uniformly coloured.

Head 2.1× as wide as FV. Head in front view almost 1.13× as wide as high. Ocelli with apical angle obtuse. Eyes 1.2× as long as malar space. Toruli with upper margins below lower lower eye margins. Antennae as Figure 1F. Pedicel 2×, F1 – 1.27×, F2 – 1.4×, F3 – 1.33×, C1 – 1.29×, C2 – 2.33× as long as wide. Scape slightly more than 4× as long as wide. Mesoscutum (25) longer than scutellum (20). Scutellum 1.5× as wide as long. Fore wings 2.3× as long as wide (Figure 1G). Marginal fringe about 0.2× the length of wing width. Submarginal: marginal: stigmal veins as follows: 38:24:5. Hind wing slightly more than 5.16× as long as wide. Marginal fringe almost 0.6× as long as wing width. Gaster slightly longer (15:13) than head plus thorax. Pygostyles inserted at the 0.74 distance from base. Ovipositor (Figure 1D) second valvifer 0.7× as long as ovipositor and third valvula 0.41× as long as second valvifer. Ovipositor 1.76× longer than midtibia.

*Male:* Unknown.

*Comments:* The species is close to *C. sumbarensis* Myartseva but differs by the morphological characters given in Table 1., also *C. sumbarensis* is entirely brown, F1 and clava also brown. The new species when it has some brownish coloration, then it is hardly noticeable.

*Etymology:* This species is named in honour of the Georgian ichthyologist and zoologist, Dr Omar Japoshvili.

***Coccobius nunu* Japoshvili, sp.n.**

*Material Examined.* *Holotype*, ♀, GEORGIA: Tbilisi, Gldanula, ex *Prodiaspis tamaricicola* (Malenotti) on *Tamarix* sp. 28.VI. – 20.VII.1998, G. Japoshvili (IZGAS). *Paratypes*, 30♀♀, same data as holotype (IZGAS).

*Female:* Length, 0.67–0.84 mm. (Holotype: 0.76 mm).

Coloration of body similar to that of *Coccobius omari* sp.n., the only difference being that this species has some brownish areas on the body. Head 1.85× as wide as FV. Head in front view almost 1.15× as wide as high. Ocelli with apical angle obtuse. Eyes slightly more than 2× as long as malar space. Toruli with upper margins level with lower eye margins or slightly lower. Antennae as Figure 1H. Pedicel 2×, F1 – 1.67×, F2 – 1.45×, F3 – 1.36×, C1 – 1.54×, C2 – 2.9× as long as wide. Scape 3.4× as long as wide. Mesoscutum (29) longer than scutellum (25). Scutellum 1.36× as wide as long. Forewings 2.3× as long as wide. Marginal fringe about 0.14× of wing width. Setation and venation as Figure 1I. Submarginal: marginal: stigmal veins as follows: 44:29:6. Hind wing 5.2× as long as wide. Marginal fringe almost 0.57× as long as wing width. Gaster longer (18:15) than head plus thorax. Pygostyles inserted at the 0.67 distance from base. Ovipositor second valvifer 0.75× as long as ovipositor and third valvula 0.37× as long as second valvifer. Ovipositor (Figure 1E) 1.67× longer than midtibia.

*Male.*—Unknown.

*Comments.*—The new species is close to *C. kurbani* Myartseva, but differs by the characters given in Table 1. This species is also

Table 1. Morphological differences between six *Coccobitus* species.

<i>C. kato</i> sp.n.	<i>C. nuni</i> sp.n.	<i>C. onari</i> sp.n.	<i>C. karbani</i>	<i>C. sumbarensis</i>	<i>C. indefinitus</i>	<i>C. ephedraspidis</i>
Scape 4× as long as wide	Scape 3.4× as long as wide	Scape 4× as long as wide	Scape more than 3× as long as wide	Scape slightly less than 5× as long as wide	Scape 4× as long as wide	Scape 3.875× as long as wide
F3 slightly longer than F2 and F1 separately	F2 shorter than F1 and F3	F3 slightly longer than F2 and F1	All funicular segments are equal in length	F3 slightly longer than F2 and F1	All funicular segments are equal in length	All funicular segments are equal in length
F1 1.56× as long as wide, F2 -1.4, F3 -1.5	F1 1.7× as long as wide, F2 -1.5, F3 -1.4	F1 1.3× as long as wide, F2 -1.4, F3 -1.3	F1 1.6× as long as wide, F2 -1.4, F3 -1.5	F1 -2 1.5× as long as wide and F3 slightly longer than wide	F1-2 1.5× as long as wide and F3 1.25× as long as wide	F1, F2, F3 -1.5× as long as wide
Clava 3.2× as long as wide	Clava 3.7× as long as wide	Clava 3.3× as long as wide	Clava 5× as long as wide	Clava 3.5× as long as wide	Clava 3.55× as long as wide	Clava 3.5× as long as wide
Fore wing 2.6× as long as wide	Fore wing 1.7× as long as wide	Fore wing 2.3× as long as wide	Fore wing 2.5× as long as wide	Fore wing slightly more than 2.5× as long as wide	Fore wing 2.8× as long as wide	Fore wing 2.8× as long as wide
Submarginal with 7 Marginal with 8 setae	Submarginal with 10 Marginal with 11 setae	Submarginal with 8 Marginal with 9 setae	Submarginal with 10 Marginal with 11 setae	Submarginal with 7 Marginal with 7 setae	Submarginal with 7 Marginal with 8 setae	Submarginal with 8-10 Marginal with 8-10 setae
Third valvulae 0.4× as long as outer plates	Third valvulae 0.37× as long as outer plates	Third valvulae 0.42× as long as outer plates	Third valvulae 0.4× as long as outer plates	Third valvulae 0.33× as long as outer plates	Third valvulae 0.33× as long as outer plates	Third valvulae 0.39× as long as outer plates
Sensilla in same plane as follows F1-2-0-2, F3 -1-2, C1 -1-2, C2-2-3	Sensilla as follows F1-2-0-2, F3 -1-2, C1 -2, C2 -2-4	Sensilla as follows F1 -0, F2 -0-1, F3 -1, C1-2-3, C2 -1-4	Sensilla as follows F1 -3 and C1 with 2, C2 -3	Sensilla as follows F1 -3 with 1, C1-2 -2	Sensilla as follows F1 -3 with 1, C1-2 -3-4	Sensilla as follows F1 -3 and C1 with 2-3, C2 -4

close to *C. viggianii* Yasnosh (Yasnosh 1974) and *C. furvus* Huang (Huang 1994), but differs from both by the sculpture on mesoscutum and scutellum. The sculpture in *C. viggianii* is with elongated cells in the middle on both mesoscutum and scutellum and *C. furvus* with polygonal cells on both mesoscutum and scutellum, but in *C. nunu* sp.n. the sculpture on the mesoscutum is polygonal and on the scutellum a little elongated. Also, there are less than 10 setae on the submarginal vein in *C. viggianii* and *C. furvus*, while there are at least setae on *C. nunu* is at least 10.

### DISCUSSION

We did not include *Coccobius mesasiaticus* (Yasnosh and Myartseva 1971) in the key and list of species of *Coccobius* of the Transcaucasian region. *Coccobius mesasiaticus* was described from Turkmenistan, and mentioned as also being distributed in Azerbaijan (Yasnosh 2000), however it was impossible to find any material from Azerbaijan to confirm its distribution there. Yasnosh (2000) cited distributional data based on Mustafaeva's doctoral thesis, but later Rzaeva (2002), in her monographic work on chalcidoids of Azerbaijan, did not mention this species. Also, G. Japoshvili could not find any information about the material from Azerbaijan (Mustafaeva pers. comm.). We would like to note that distributional data concerning Afganistan and Iran (Hayat 1985) is also doubtful, in as much as Hayat did not mention the examined material and sources of data.

### ACKNOWLEDGMENTS

Special thanks to Dr Takumasa Kondo for checking the English to promote this paper.

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